

SEQUENCE LISTING

In the following SEQ ID Nos. 1, 3, 5 the 5', coding sequence and 3' sequence of the relevant α -amylase genes are illustrated. The 5' sequence is the first separate part of the sequence written with lower case letters, the coding sequence is the intermediate part of the sequence, where the signal sequence is written with lower case letters and the sequence encoding the mature α -amylase is written with upper case letters, and the 3' sequence is the third separate part of the sequence written with lower case letters.

SEQ ID No. 1

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15 VQR

SEQ ID No. 3

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SEQ ID No. 5

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SEQ ID No. 6

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SEQ ID No. 10

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SEQUENCE LISTING

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 Borchert, Torben
 Bisgard-Frantzen, Henrik

<120> Alpha-Amylase Mutants

<130> 4796.234-US

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<212> PRT

<213> Bacillus licheniformis

<400> 2

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aatccggggtt	ttgcggcgtt	tggctttttc	acatgtctga	tttttgtata	atcaacaggc	1980
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<210> 4
<211> 480
<212> PRT
<213> Bacillus amyloliquefaciens
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 Ile Gly Ile Thr Ala Val Trp Ile Pro Pro Ala Tyr Lys Gly Leu Ser
 35 40 45
 Gln Ser Asp Asn Gly Tyr Gly Pro Tyr Asp Leu Tyr Asp Leu Gly Glu
 50 55 60
 Phe Gln Gln Lys Gly Thr Val Arg Thr Lys Tyr Gly Thr Lys Ser Glu
 65 70 75 80
 Leu Gln Asp Ala Ile Gly Ser Leu His Ser Arg Asn Val Gln Val Tyr
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 Gly Asp Val Val Leu Asn His Lys Ala Gly Ala Asp Ala Thr Glu Asp
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 Val Thr Ala Val Glu Val Asn Pro Ala Asn Arg Asn Gln Glu Thr Ser
 115 120 125
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 Gly Asn Thr Tyr Ser Asp Phe Lys Trp His Trp Tyr His Phe Asp Gly
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 Gly Glu Gly Lys Ala Trp Asp Trp Glu Val Ser Ser Glu Asn Gly Asn
 180 185 190
 Tyr Asp Tyr Leu Met Tyr Ala Asp Val Asp Tyr Asp His Pro Asp Val
 195 200 205
 Val Ala Glu Thr Lys Lys Trp Gly Ile Trp Tyr Ala Asn Glu Leu Ser
 210 215 220
 Leu Asp Gly Phe Arg Ile Asp Ala Ala Lys His Ile Lys Phe Ser Phe
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 Leu Arg Asp Trp Val Gln Ala Val Arg Gln Ala Thr Gly Lys Glu Met
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 Phe Thr Val Ala Glu Tyr Trp Gln Asn Asn Ala Gly Lys Leu Glu Asn
 260 265 270
 Tyr Leu Asn Lys Thr Ser Phe Asn Gln Ser Val Phe Asp Val Pro Leu
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 His Phe Asn Leu Gln Ala Ala Ser Ser Gln Gly Gly Gly Tyr Asp Met
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 355 360 365
 Thr Lys Gly Thr Ser Pro Lys Glu Ile Pro Ser Leu Lys Asp Asn Ile
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 385 390 395 400
 Asp Tyr Ile Asp His Pro Asp Val Ile Gly Trp Thr Arg Glu Gly Asp
 405 410 415
 Ser Ser Ala Ala Lys Ser Gly Leu Ala Ala Leu Ile Thr Asp Gly Pro
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 Gly Gly Ser Lys Arg Met Tyr Ala Gly Leu Lys Asn Ala Gly Glu Thr
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<210> 5
 <211> 1814
 <212> DNA
 <213> Bacillus stearothermophilus

<400> 5

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gttcggtttc	ggtttggttt	cctagaaaaa	cgaccgtttc	taccatcgct	cggccgatca	1740
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<210> 6

<211> 514

<212> PRT

<213> *Bacillus stearothermophilus*

<400> 6

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			20					25					30		
Leu	Ser	Ser	Leu	Gly	Ile	Thr	Ala	Leu	Trp	Leu	Pro	Pro	Ala	Tyr	Lys
			35				40					45			
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Leu	Gly	Glu	Phe	Asn	Gln	Lys	Gly	Thr	Val	Arg	Thr	Lys	Tyr	Gly	Thr
	65				70					75				80	
Lys	Ala	Gln	Tyr	Leu	Gln	Ala	Ile	Gln	Ala	Ala	His	Ala	Ala	Gly	Met
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Gln	Val	Tyr	Ala	Asp	Val	Val	Phe	Asp	His	Lys	Gly	Gly	Ala	Asp	Gly
			100					105					110		
Thr	Glu	Trp	Val	Asp	Ala	Val	Glu	Val	Asn	Pro	Ser	Asp	Arg	Asn	Gln
	115					120						125			
Glu	Ile	Ser	Gly	Thr	Tyr	Gln	Ile	Gln	Ala	Trp	Thr	Lys	Phe	Asp	Phe
	130					135					140				
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Phe	Asp	Gly	Val	Asp	Trp	Asp	Glu	Ser	Arg	Lys	Leu	Ser	Arg	Ile	Tyr
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 355 360 365
 Tyr Tyr Gly Ile Pro Gln Tyr Asn Ile Pro Ser Leu Lys Ser Lys Ile
 370 375 380
 Asp Pro Leu Leu Ile Ala Arg Arg Asp Tyr Ala Tyr Gly Thr Gln His
 385 390 395 400
 Asp Tyr Leu Asp His Ser Asp Ile Ile Gly Trp Thr Arg Glu Gly Gly
 405 410 415
 Thr Glu Lys Pro Gly Ser Gly Leu Ala Ala Leu Ile Thr Asp Gly Pro
 420 425 430
 Gly Gly Ser Lys Trp Met Tyr Val Gly Lys Gln His Ala Gly Lys Val
 435 440 445
 Phe Tyr Asp Leu Thr Gly Asn Arg Ser Asp Thr Val Thr Ile Asn Ser
 450 455 460
 Asp Gly Trp Gly Glu Phe Lys Val Asn Gly Gly Ser Val Ser Val Trp
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 485 490 495
 Arg Pro Trp Thr Gly Glu Phe Val Arg Trp Thr Glu Pro Arg Leu Val
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 Ala Trp

<210> 7
 <211> 478
 <212> PRT
 <213> Bacillus licheniformis

<400> 7
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 35 40 45
 Leu Asp Tyr Ile Gln Gly Met Gly Phe Thr Ala Ile Trp Ile Thr Pro
 50 55 60
 Val Thr Ala Gln Leu Pro Gln Thr Thr Ala Tyr Gly Asp Ala Tyr His
 65 70 75 80
 Gly Tyr Trp Gln Gln Asp Ile Tyr Ser Leu Asn Glu Asn Tyr Gly Thr
 85 90 95
 Ala Asp Asp Leu Lys Ala Leu Ser Ser Ala Leu His Glu Arg Gly Met
 100 105 110
 Tyr Leu Met Val Asp Val Val Ala Asn His Met Gly Tyr Asp Gly Ala
 115 120 125
 Gly Ser Ser Val Asp Tyr Ser Val Phe Lys Pro Phe Ser Ser Gln Asp
 130 135 140
 Tyr Phe His Pro Phe Cys Phe Ile Gln Asn Tyr Glu Asp Gln Thr Gln
 145 150 155 160
 Val Glu Asp Cys Trp Leu Gly Asp Asn Thr Val Ser Leu Pro Asp Leu
 165 170 175
 Asp Thr Thr Lys Asp Val Val Lys Asn Glu Trp Tyr Asp Trp Val Gly
 180 185 190
 Ser Leu Val Ser Asn Tyr Ser Ile Asp Gly Leu Arg Ile Asp Thr Val
 195 200 205
 Lys His Val Gln Lys Asp Phe Trp Pro Gly Tyr Asn Lys Ala Ala Gly
 210 215 220
 Val Tyr Cys Ile Gly Glu Val Leu Asp Gly Asp Pro Ala Tyr Thr Cys
 225 230 235 240
 Pro Tyr Gln Asn Val Met Asp Gly Val Leu Asn Tyr Pro Ile Tyr Tyr
 245 250 255

Pro Leu Leu Asn Ala Phe Lys Ser Thr Ser Gly Ser Met Asp Asp Leu
 260 265 270
 Tyr Asn Met Ile Asn Thr Val Lys Ser Asp Cys Pro Asp Ser Thr Leu
 275 280 285
 Leu Gly Thr Phe Val Glu Asn His Asp Asn Pro Arg Phe Ala Ser Tyr
 290 295 300
 Thr Asn Asp Ile Ala Leu Ala Lys Asn Val Ala Ala Phe Ile Ile Leu
 305 310 315 320
 Asn Asp Gly Ile Pro Ile Ile Tyr Ala Gly Gln Glu Gln His Tyr Ala
 325 330 335
 Gly Gly Asn Asp Pro Ala Asn Arg Glu Ala Thr Trp Leu Ser Gly Tyr
 340 345 350
 Pro Thr Asp Ser Glu Leu Tyr Lys Leu Ile Ala Ser Ala Asn Ala Ile
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 Arg Asn Tyr Ala Ile Ser Lys Asp Thr Gly Phe Val Thr Tyr Lys Asn
 370 375 380
 Trp Pro Ile Tyr Lys Asp Ile Thr Ile Ala Met Arg Lys Gly Thr
 385 390 395 400
 Asp Gly Ser Gln Ile Val Thr Ile Leu Ser Asn Lys Gly Ala Ser Gly
 405 410 415
 Asp Ser Tyr Thr Leu Ser Leu Ser Gly Ala Gly Tyr Thr Ala Gly Gln
 420 425 430
 Gln Leu Thr Glu Val Ile Gly Cys Thr Thr Val Thr Val Gly Ser Asp
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 <213> *Bacillus amyloliquefaciens*

<400> 8
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<210> 9
 <211> 20
 <212> DNA
 <213> *Bacillus amyloliquefaciens*

<400> 9
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<210> 10
 <211> 31
 <212> DNA
 <213> *Bacillus licheniformis*

<400> 10
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<210> 11
 <211> 36
 <212> DNA
 <213> *Bacillus licheniformis*

<400> 11
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<210> 12
 <211> 28

<212> DNA
 <213> Bacillus licheniformis

 <400> 12
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 <210> 13
 <211> 31
 <212> DNA
 <213> Bacillus licheniformis

 <400> 13
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 <210> 14
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 <210> 15
 <211> 31
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 <400> 15
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 <210> 16
 <211> 36
 <212> DNA
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 <210> 17
 <211> 30
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 <213> Bacillus licheniformis

 <400> 17
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 <210> 18
 <211> 34
 <212> DNA
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 <212> DNA
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 <210> 20

<211> 32
 <212> DNA
 <213> *Bacillus licheniformis*

 <400> 20
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 <210> 21
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 <212> DNA
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 <400> 21
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 <210> 22
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 <212> DNA
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 <400> 22
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 <210> 23
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 <210> 25
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 <400> 25
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 <210> 26
 <211> 36
 <212> DNA
 <213> *Bacillus licheniformis*

 <400> 26
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 <210> 27
 <211> 36
 <212> DNA
 <213> *Bacillus amyloliquefaciens*

 <400> 27
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<210> 28
<211> 38
<212> DNA
<213> Bacillus amyloliquefaciens

<400> 28
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<210> 29
<211> 30
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<213> Bacillus amyloliquefaciens

<400> 29
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<210> 30
<211> 21
<212> DNA
<213> Bacillus amyloliquefaciens

<400> 30
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<210> 31
<211> 75
<212> DNA
<213> Bacillus licheniformis

<400> 31
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gacgagtccc gaaag 75

<210> 32
<211> 84
<212> DNA
<213> Bacillus licheniformis

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rskaaactatg attatttgat gtat 84

<210> 33
<211> 72
<212> DNA
<213> Bacillus licheniformis

<220>
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<223> N at 37 is 81% G, 7% A, 7% T, 5% C

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<210> 34
<211> 78
<212> DNA
<213> Bacillus licheniformis

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<221> misc_feature

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<222> (0)...(0)
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<210> 35
<211> 63
<212> DNA
<213> Bacillus licheniformis

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ttt 63

<210> 36
<211> 78
<212> DNA
<213> Bacillus licheniformis
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tttcaaggaa aggcttgg 78

<210> 37
<211> 93
<212> DNA
<213> Bacillus licheniformis

<220>
<221> misc_feature
<222> (0)...(0)
<223> N at 43 is 81% G, 8% T, 3% C

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avcargacar attttaatca ttcagtgttt gac 93

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